in a preliminary explanation, but the fact should finally be made clear that the second law of motion is quite independent of the law of gravitation and of the facts of terrestrial gravity. The fact that the word weight is usually associated with gravity makes the term "standard weight" misleading and inappropriate as the name of a "characteristic of the given body" which has nothing to do with gravity.[11]

Full comment on the latest communications of Mr. Kent and Professor Huntington would consist largely of the repetition of comments made in previous communications by myself and others, and I shall take space only for a remark regarding their attitude toward the equation $F = ma$. They agree in objecting most strenuously to the use of this equation. The grounds of the objection as stated by Professor Huntington are that it implies "a perfectly arbitrary choice of units" and a choice that is "needlessly complicated and quite unscientific." When these objections are considered in connection with the units endorsed by both Mr. Kent and Professor Huntington, the implication seems to be that it is less arbitrary, less complicated and more scientific to define a unit force as "the force which would give the unit mass 32.1740 units of acceleration" than as "the force which would give the unit mass one unit of acceleration." What reason there is for such a supposition it is not easy to see.

The fact that the choice of units is always arbitrary is indeed a very important fact to emphasize with students, and probably the only way to do this effectively is to give practise in the use of different sets of units in solving the same problems. If any author states or implies that the unit force *must* be defined as the force which would give unit mass unit acceleration, he makes an unfortunate mistake; but the same may be said of one who states or implies that the force which would give a unit mass 32.1740 units of acceleration is other than an arbitrarily chosen unit.

[11] This inappropriateness is strikingly apparent in referring to astronomical masses. In a recent lecture by an astronomer of high reputation the statement was made that the sun contains more than 97 per cent. of the matter in the solar system. How would this fact be expressed by Professor Huntington? Would he speak of the "standard weights" of the sun and the solar system?

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April 8, 1916

ELECTRICAL ACTION AND THE GRAVITATION CONSTANT

In Science for December 31 Professor Nipher suggests that previous determinations of the gravitation constant may be in error, owing to the force action of electric charges on the attracting masses. The point is interesting, but in estimating the possible magnitude of the effect the author seems to have committed a serious error.

He puts the charge Q on a sphere equal to RV, where R is the radius and V is the *absolute* potential of the sphere. But this equation holds only when the sphere is alone in space; otherwise it may be nowhere near true. Consider, for instance, an insulated uncharged sphere inside a closed metal box. By charging up the box we may change the absolute potential of the sphere by a large amount without placing any charge whatever upon the sphere itself.

If Professor Nipher really has made this slip, he is at least in august company. For no less an authority than Boltzmann fell into a similar error, when he set the capacity of a conducting molecule *between two conducting plates* equal to its radius.[1]

In the classical experiments on the gravitation constant charges certainly existed on the attracting masses, in consequence of contact potentials between metals if for no other reason. But Professor Nipher's calculation indicates a possible error due to contact potentials of only a per cent. or two. Furthermore, the electric effect would be enormously influenced by the nature and arrangement of other parts of the apparatus, and these have varied widely. It seems doubtful, therefore, whether the actual error due to this cause can exceed the very

[1] Gastheorie, I., p. 79.

small discrepancies between the best modern determinations of the constant.

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GRAVITATION AND ELECTRICAL ACTION

IN a recent number of SCIENCE[1] Professor F. E. Nipher has pointed out that the force exerted between two isolated solid spheres depends not only upon their mutual gravitational attraction, but also upon the electrostatic charges carried upon their surfaces, and suggests that this fact has been ignored in determinations of the gravitational constant by experimenters from Cavendish to Boys. The fact that the potential of the earth relative to points infinitely remote is not necessarily zero, and the further fact that the earth's surface may at a given time and place be heavily charged owing to volume changes in the atmosphere are urged to show that the spheres employed in the experiments referred to may have carried appreciable charges.

That Professor Nipher's expression for the electrostatic force between two charged spheres is applicable only to the case in which the distance between their centers is great compared with the radius of the larger is perhaps of little importance in view of the fact that the torsional systems in all experiments on the gravitational constant have been effectively shielded from electrostatic action. The important condition is, of course, that displacements of the torsional system shall not alter the electrostatic capacity of the earth, or of the earth-atmosphere condenser, and this condition is satisfied when the system is surrounded by a conducting casing. In Boys' experiment the torsional system was enclosed in a double metal casing and the apparatus was installed in an underground vault.

It does not seem impossible that contact differences of potential between the parts of the torsional system and the casing may have affected results in some of the experiments, although in Boys' experiment the symmetry of the apparatus was such that forces arising from contact differences of potential could have exerted only inappreciable torques on the suspended system.

There would seem to be little reason for thinking that the gravitational constant is not known to within one part in 3,000, Professor Boys' estimate.

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[1] March 31, 1916, page 472.

AMBYSTOMA NOT AMBLYSTOMA

IN view of the recent difficulty I have experienced in trying to have the generic name of the spotted salamander spelled *Ambystoma* as originally written by Tschudi, it seems desirable to call attention to the correct form of the word. In reporting the exhibition of a specimen of this salamander before the Biological Society of Washington I took pains to see that the word was correctly spelled in manuscript. The report has appeared in print twice and in each instance an *l* has been inserted by the publisher.[1]

The word was proposed by Tschudi[2] in 1839 and written by him *Ambystoma* in four different places in his work, and only in that manner. The derivation of the word is not given by him and there is nothing to indicate that he intended *Amblystoma* and made a lapsus calami. The first author to employ *Amblystoma* was Agassiz[3] in 1842–1846. This spelling has had a very wide acceptance and it is the one usually employed by morphologists, embryologists, physiologists and others who are not systematists. A discussion of the appropriateness of *Ambystoma* and its possible derivation from ἀνὰ στόμα βύειν meaning to cram into the mouth is given by Stejneger in his "Herpetology of Japan."[4] The correct form of the word is employed by Hegner[5] in his "College Zoology," but aside from this most of the non-specialist authors that I have lately seen incorrectly spell the word with the *l* inserted.

[1] *Jour. Wash. Acad. Sci.*, Vol. 6, p. 258, May 4, 1916. SCIENCE, N. S., Vol. 43, p. 761, May 26, 1916.

[2] *Mém. Soc. Sci. Nat. Neuchatel*, Vol. 2, section 4, pp. 57 and 92, 1839.

[3] Nomencl. Zool. Rept., p. 2, 1842–46.

[4] *Bull. U. S. Nat. Mus.*, No. 85, p. 24, July 22, 1907.

[5] "College Zoology," p. 511, 1912.